

CLAIMS

What is claimed is:

1. A curable solid resin made by the process comprising the steps of:
 - A) providing a heat-settable mixture comprising a resin component, a curing agent component and a particulate component, said heat-settable mixture having a curing temperature such that said heat-settable mixture forms a cured resin when heated to a temperature equal to or greater than said curing temperature and wherein said particulate component comprises particles of a rigid-rod polymer that have a dissolution temperature where said rigid-rod polymer particles dissolve in said resin component, said particulate component being present in an amount such that said heat-settable resin mixture forms a heat-set mixture when said heat-settable resin mixture is heated to a temperature that is equal to or above the dissolution temperature of said rigid-rod polymer and below said curing temperature of the heat-settable mixture;
 - B) heating the heat-settable resin mixture to a temperature that is equal to or above the dissolution temperature of said rigid-rod polymer and below the curing temperature of said heat-settable mixture for a sufficient time to form said heat-set mixture; and
 - C) cooling said heat-set mixture to a temperature below the dissolution temperature of said rigid-rod polymer to form said curable solid resin.
2. A curable solid resin composite body comprising fibers and a curable solid resin according to claim 1.
3. A curable solid resin according to claim 1 wherein said rigid-rod polymer has a 1,4 phenylene backbone.
4. A curable solid resin according to claim 3 wherein said rigid-polymer with a 1,4 phenylene backbone is PX1000 or PX1200.
5. A curable solid resin according to claim 1 wherein the curing temperature of said heat-settable mixture is above 120°C.
6. A curable solid resin according to claim 1 wherein the dissolution temperature of said rigid-rod polymer is between 75°C and 125°C.

7. A cured resin formed by the step of heating the curable solid resin according to claim 1 to a temperature above said curing temperature for a sufficient time to cure said curable solid resin to form said cured resin.

8. A cured composite body comprising fibers and a cured resin according to claim 7.

9. A cured resin according to claim 7 wherein said rigid-rod polymer has a 1,4 phenylene backbone.

10. A cured resin according to claim 9 wherein said rigid-polymer with a 1,4 phenylene backbone is PX1000 or PX1200.

11. A cured resin according to claim 7 wherein the curing temperature of said heat-settable mixture is above 120°C.

12. A cured resin according to claim 7 wherein the dissolution temperature of said rigid-rod polymer is between 75°C and 125°C.

13. A method for making a curable solid resin comprising the steps of:

A) providing a heat-settable mixture comprising a resin component, a curing agent component and a particulate component, said heat-settable mixture having a curing temperature such that said heat-settable mixture forms a cured resin when heated to a temperature equal to or greater than said curing temperature and wherein said particulate component comprises particles of a rigid-rod polymer that have a dissolution temperature where said rigid-rod polymer particles dissolve in said resin component, said particulate component being present in an amount such that said heat-settable resin mixture forms a heat-set mixture when said heat-settable resin mixture is heated to a temperature that is equal to or above the dissolution temperature of said rigid-rod polymer and below said curing temperature of the heat-settable mixture;

B) heating the heat-settable resin mixture to a temperature that is equal to or above the dissolution temperature of said rigid-rod polymer and below the curing temperature of said heat-settable mixture for a sufficient time to form said heat-set mixture; and

C) cooling said heat-set mixture to a temperature below the dissolution temperature of said rigid-rod polymer to form said curable solid resin.

14. A method for making a curable solid prepreg comprising the steps of:

A) combining fibers with a heat-settable resin mixture to form a heat-settable prepreg layer, said heat-settable resin mixture comprising a resin component, a curing agent component and a particulate component, said heat-settable mixture having a curing temperature such that said heat-settable mixture forms a cured resin when heated to a temperature equal to or greater than said curing temperature and wherein said particulate component comprises particles of a rigid-rod polymer that have a dissolution temperature where said rigid-rod polymer particles dissolve in said resin component, said particulate component being present in an amount such that said heat-settable resin mixture forms a heat-set mixture when said heat-settable resin mixture is heated to a temperature that is equal to or above the dissolution temperature of said rigid-rod polymer and below said curing temperature of the heat-settable mixture;

B) heating the heat-settable prepreg layer to a temperature that is equal to or above the dissolution temperature of said rigid-rod polymer and below the curing temperature of said heat-settable mixture for a sufficient time to form a heat-set prepreg; and

C) cooling said heat-set prepreg to a temperature below the dissolution temperature of said rigid-rod polymer to form said curable solid prepreg.

15. A method for making a curable solid prepreg according to claim 14 wherein said rigid-rod polymer has a 1,4 phenylene backbone.

16. A method for making a curable solid prepreg according to claim 14 wherein said rigid-polymer with a 1,4 phenylene backbone is PX1000 or PX1200.

17. A method for making a curable solid prepreg according to claim 14 wherein the curing temperature of said heat-settable mixture is above 120°C.

18. A method for making a curable solid prepreg according to claim 14 wherein the dissolution temperature of said rigid-rod polymer is between 75°C and 125°C.

19. A method for making a curable solid composite body comprising the steps of:

A) combining fibers with a heat-settable resin mixture to form at least two heat-settable prepreg layers, said heat-settable resin mixture comprising a resin component, a curing agent component and a particulate component, said heat-settable mixture having a curing temperature such that said heat-settable mixture forms a cured resin when heated to a temperature equal to or greater than said curing temperature and wherein said particulate component comprises particles of a rigid-rod polymer that have a dissolution temperature where said rigid-rod polymer particles dissolve in said resin component, said particulate component being present in an amount such that said heat-settable resin mixture forms a heat-set mixture when said heat-settable resin mixture is heated to a temperature that is equal to or above the dissolution temperature of said rigid-rod polymer and below said curing temperature of the heat-settable mixture;

B) placing said at least two heat-settable prepreg layers together to form a heat-settable prepreg body;

C) heating said heat-settable prepreg body at a temperature equal to or above the dissolution temperature of said rigid-rod polymer and below the curing temperature of said heat-settable mixture for a sufficient time to heat-set said prepreg layers and form a heat-set prepreg body; and

D) cooling said heat-set prepreg body to a temperature below the melting point of said rigid-rod polymer to form said curable solid composite body.

20. A method for making a curable solid composite body according to claim 19 wherein said rigid-rod polymer has a 1,4 phenylene backbone.

21. A method for making a curable solid composite body according to claim 19 wherein said rigid-polymer with a 1,4 phenylene backbone is PX1000 or PX1200.

22. A method for making a curable solid composite body according to claim 19 wherein the curing temperature of said heat-settable mixture is above 120°C.

23. A method for making a curable solid composite body according to claim 19 wherein the dissolution temperature of said rigid-rod polymer is between 75°C and 125°C.

24. A method for making a cured composite layer comprising the step of heating the curable solid prepreg made according to claim 14 at a temperature equal to or above said curing temperature under ambient pressure for a sufficient time to form said cured composite layer.

25. A method for making a cured composite body comprising the step of heating the curable solid composite body made according to claim 29 at a temperature equal to or above said curing temperature under ambient pressure for a sufficient time to form said cured composite layer.